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Journal of the Society of Arts.

FRIDAY, MAY 1, 1857.

NOTICE TO MEMBERS AND INSTITUTIONS.

The prizes awarded by the Society's Examiners to the successful Candidates at the June Examination in London will be distributed on the morning of Tuesday, the 23rd of June, at the Society's House in the Adelphi.

The Society's Annual Dinner will take place at the Crystal Palace in the afternoon of the same day.

The Sixth Annual Conference of the Representatives from Institutions in Union with the Society, is appointed to be held at the Society's House on Wednesday the 24th of June.

The Annual General Meeting for receiving the report of the Council and the Treasurer's statement of receipts, payments, and expenditure during the past year, and also for the Election of Officers, will, in accordance with the Bye-Laws, take place at 4 o'clock on the same day.

CONVERSAZIONE.

The Society's Second Conversazione will take place on Wednesday evening, the 6th of May. On this evening the Pictures and Sketches of the late Thomas Seddon, Esq., will be exhibited, and an address will be delivered by John Ruskin, Esq. Gentlemen only are invited to this Conversazione. Cards have been issued to the members. Any member not having received his card is requested to communicate with the Secretary.

HONORARY LOCAL SECRETARY.

The following gentleman has been appointed Honorary Local Secretary:—

The Rev. J. Maxwell Weir, Leek.

TWENTIETH ORDINARY MEETING.

WEDNESDAY, APRIL 29, 1857.

The Twentieth Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 29th inst., the Rev. Dr. Booth, F.R.S., in the chair.

The following Candidates were balloted for and duly elected members of the Society:—

Byron, Henry	Devey, George
Corthorn, Charles	Green, the Rev. Charles
Daniel, J. C., LL.D.	Stroud, M.A.
Hiscocks, Alfred J.	

The paper read was:—

METROPOLITAN IMPROVEMENTS AND THAMES EMBANKMENT.

By FRANCIS BENNOCH.

The subject on which I have undertaken to read a paper this evening is, even in its most limited sense, sufficient to chill one's enthusiasm and appal the most courageous improver; but, taken comprehensively, the difficulty is immensely increased. It is hard to resolve where to begin and what to reject, so as to touch the most important points, and bring them all within the compass of an hour's address. To treat shortly and intelligently a subject which embraces whatever relates to the health, comfort, convenience, and general well-being of two millions and a-half of people, involves no trifling responsibility. Nothing calculated to improve their condition ought to be excluded. Ventilation, drainage, sewage, public parks, baths, wash-houses, and all other sanitary regulations, whether superintended by Corporations, Royal Commissions, Boards of Works, Parish Vestries, or Local Boards, are necessarily included under the general idea of Metropolitan Improvements.

From such a catalogue of matters demanding our attention we ought not to consider as unworthy of our notice, water companies, gas companies, paving principles, or street cleansing; but as each subject enumerated possesses in itself material sufficient for a single paper, I shall content myself with cursorily touching them as I pass, and now proceed to the more immediate duty I have to perform, my purpose being to confine my remarks to such improvements in our public thoroughfares as will give increased facilities for the traffic of the metropolis.

Before proceeding to consider our streets as they absolutely exist, we will rapidly survey the past, so as to enable us more justly to appreciate the present, and partially excuse the difficulties that beset us. No people have ever been sufficiently far-seeing to anticipate accurately the wants of the future. Streets amply commodious a hundred years ago are altogether insufficient for the necessities of to-day. So short-sighted are persons in power, that before the completion of their approved designs they are frequently obliged to confess their blunder, and regret the mistake they have committed. The New London-bridge was widened considerably after the first design was settled and accepted, and had it been increased by twenty feet additional, the public advantage would have been better consulted. An idea prevailed in the City that fifty feet was ample for any first-rate street. Moorgate-street and New Cannon-street were laid down and built under that idea by the then Chairman of the Improvement Committee, in opposition to the better judgment of their eminent architect. The result is that entering Moorgate-street from the wider street beyond, is like entering a well. Prejudice ruled, and reason was left in abeyance. No first-class leading thoroughfare ought to be constructed on a scale of less than sixty feet between the houses, from front to front. Nine feet for the foot pavement on each side, and forty-two feet for the roadway. This would enable two persons to walk abreast, and allow one person to pass in each direction on each side of the street; 42 feet for the carriage way gives room for five or six conveyances; one to stand, when necessary, by the kerb on each side; one line of slow waggons and another of swift cabs to proceed in either direction. This establishes a principle that should ever be maintained. A less width is productive of many interruptions, a greater width in a street of business or general traffic might lead to confusion, but could not improve the convenience, while to cross on foot would be attended with considerable difficulty, if not absolute danger.

That the thoroughfares of London should continue as they are, is discreditable to us as an enter-

prising people. There is not on the face of the globe a finer situation for the metropolis of the trade, the commerce, the wealth and the luxury of the civilised world; and those who chose it displayed good sense and judgment. Never dreaming of the marvellous future they only consulted their then necessities. A sea-faring people, their highways were the rivers. Liable to attack from hostile tribes, their security was promoted by adopting a locality combining in itself the greatest number of natural advantages; the first being contiguity to the ocean, and yet with sufficient distance to render any sudden attack unlikely by day, and utterly impracticable under the shadow of night, the serpentine course of the Thames rendering navigation in the dark utterly hopeless. The second advantage was its excellent situation for agricultural and grazing purposes. The natural soil being composed of gravel and loamy clay, rendered very productive by the application of the refuse matter of large towns; the surface of the ground beautifully undulating, with a great variety of gentle hills and pleasant dells; the air temperate but moist, and innumerable springs supplying an abundance of the purest water, made and make London by nature one of the healthiest situations that could have been selected. Ascending the river, the site chosen was the first really appropriate. Though easy of approach, the banks were, nevertheless, sufficiently elevated to form a natural barrier against the encroachment of the tides.

It requires no effort of the imagination to stretch back a couple of thousand years and witness the painted natives building their tiny huts by the side of their pleasant river. Coming down the stream of time we observe them gradually change. The straggling structures increase in number, and by and by unite to form a picturesque but irregular row of inconvenient cabins; population increased, but the banks of the river were inflexible and could not be extended, nor would it have been consistent with the habits of the times for the inhabitants to be scattered and dwelling far apart. They clustered together for mutual protection, and, therefore, another straggling row in the rear of the first appeared and formed the first street. Another and another followed, until the sides of the gentle slopes were covered with the huts of the early settlers. The space between the houses would necessarily be only such as to permit the inhabitants to pass and repass with their burdens on their heads or shoulders. When pack-horses superseded human labour in the heavier work, the streets were, no doubt, found too narrow; and, true to their nature, it is to be expected that some excited and sturdy Briton denounced the then Chief Commissioner of Works for neglect of duty. A collection of such speeches would, even now-a-days, be of rare value, when no man seems to have capacity or power enough to grasp and conquer the giant evil. The streets, then as now, followed the course of the river, narrow, winding and inconvenient. In England, Scotland, Ireland, on the continent, and even in the United States, this law holds good. The river forms the base and determines the direction of the streets.

Turnpike roads, canals and railways, those triumphs of the genius of Macadam, Brindley, and Stephenson, in facilitating the intercourse of man with man, have considerably modified the laws previously existing, and streets, straight as a line, and of admirable width, instead of being the exception, are becoming the rule. The founders of the city of Philadelphia were the first to abandon the picturesque, and determine that utility was the only rational principle that a reasonable people should adopt. But nature seems to rebel against any and every system that would attempt to fashion it into anything like perfect uniformity. The streets of Philadelphia are in their arrangements as regular and formal as the squares on a chessboard, and can, from end to end, be flushed with the crystal water of the Schuylkill every hour in the day. In seeking for improvement and per-

fect utility they have failed to secure uninterrupted privacy; so exactly alike are all the streets in the square, the same marble cornices, the same silver-plated handles and knockers on the doors or bell-pull knobs, the same tell-tales at either side the window, the same number of marble steps leading to the door, and the same railing around the area, that even the oldest inhabitant is liable to invade his neighbour's house. The doors are the same without, and the passages are the same within, so that a person may take off his over-coat, hang up his hat, and never discover his mistake till startled by a goddess with a shrill voice demanding what the stranger wants in her premises.

The growth of London was like the growth of the English oak—slow but sure—as if destined to live for ever; and like the oak, too, the first sign of decay was found near the centre.

The earliest reliable map gives us an idea of the metropolis 200 years ago. The old City of London, with its cathedral in the centre, seems to be a mere handful of houses when contrasted with the endless labyrinth of ways that now constitute the great metropolis. Beyond the City boundary, and outside its liberties, we had the Moorfields, Spa-fields, Conduit-fields, and the fields of Lincoln's-inn. Within a comparatively recent period, the borough of Southwark was resorted to as a place of amusement and healthy exercise for the younger men, with an occasional mansion occupied by the wealthier merchants; the custom then being for the general citizens, whatever their grade, to reside at their place of business.

Still the City grew; and grew with it all the inconveniences that marked the formation of its first street: narrow, undrained, with no free circulation of air, and with closely pent-up houses, overhanging the streets and shutting out the light. The congregation of dwellings and closely packed inhabitants became a nuisance, reeking with every imaginable abomination. Its filthiness brought its own punishment; plague and pestilence came with avenging swords, and periodically slew thousands of the people. By fasts, prostrations, and prayers, they hoped to appease offended Deity, and overcome the physical laws established by their Creator; but still the epidemic came, and all the sufferings that afflict dirty humanity could not, and would not be banished, because they neglected simple cleanliness, so near akin to godliness. At last, as a boon, and as a blessing, came the great fire of 1666; conferring on the citizens of London opportunities and advantages similar in kind, if not in degree, to those which the late famine conferred on Ireland; rendering possible for the first time in its history the introduction of a wiser system. What appeared to be a dire calamity proved to be a heavenly visitation, the commencement of a new era, the dawn of a brighter day.

Then, as now, the authorities were unequal to their position, and did not appreciate the lofty conceptions of their men of genius. Wren might unleash his imagination, and give his genius scope. Delighted with his conception, he might revel in glorious visions of a new and regenerate city rising from the cooling embers of the old, eclipsing in its grandeur and its beauty every city on the earth. But it was not to be. Red tape existed then as now, and the philosophical architect was thwarted in every possible way by the envious hand of the then illustrious Barnacle. The plan suggested by Wren for the rebuilding of the City was, of course, rejected by the authorities, and the old City was reproduced with all its evils restored or aggravated. It is humiliating to observe, that the wiser the alterations, and the greater the improvements now recommended, the nearer they approach the design of the great Christopher, to whose memory be every honour paid. The precise features of the plan suggested by Sir Christopher Wren being imperfectly known, I have caused it to be laid down on a large scale, so that you

may thoroughly understand it without difficulty. That plan is now before you.

So soon as a city bursts the bonds of its commercial requirements or trading necessities, and its merchants have realised property sufficient to be independent of trade, a new condition of things appears, different streets are introduced, regulated by laws as invariable as those that existed when the first street was formed. The primary object in constructing the original houses was convenience for the purposes of gain; the second series of houses springs from the fact of accumulated wealth, and designs are produced on a scale of corresponding magnificence; the object being to gratify the senses by the indulgence of every luxury.

The first streets, as we have seen, are regulated by the course of the river; the second take an independent course. In almost every city the Eastern district is devoted to labour, the Western district to recreation and its attendant pleasures. The cause of the difference, so far as London is concerned, is perfectly clear. Begin where we will, the first house becomes the centre of the system, and as the houses increase they form a village, town, or city, and there must be to each an Eastern and a Western side. The earliest founded becomes the centre of trade producing abundant wealth. With independence arises the desire to enjoy the fruits of industry. The North may be too chill, the South too warm, the East full of bustle and vapour, but the West is during nine months in the year free from the annoying smoke which the prevailing wind kindly drifts towards the East. To the West, therefore, the man of pleasure retires, and there establishes himself. In the course of a few years he becomes the centre of a circle whose sole object in life seems to be the pursuit of enjoyment, often frivolous, and not unfrequently sinful. Though dwelling in the uncrowded West, they are nevertheless compelled occasionally, generally quarterly, to demean themselves by visiting the precincts of trade, and so a free thoroughfare is established East and West. Whatever course the streets of trade may take, the streets of pleasure are generally East and West. This is the case, not only in London, but in Brighton, Birmingham, Manchester, Leeds, Huddersfield, Glasgow, Edinburgh and Dublin; the whole being determined by the current of the wind. Mr. Glaisher, of the Royal Observatory, Greenwich, and one of our Council, has furnished me with several very elaborate tables bearing upon this point, which, I regret to say, I have been unable to use as fully as I at first intended. This, however, may prove to be an advantage to the Society, for I would suggest to our friend the propriety of his preparing a Paper for next session, to be entitled, "WHICH WAY DOES THE WIND BLOW?" I am convinced that such a Paper, founded on his almost innumerable but accurate observations, with the several principles legitimately deducible from them, could not fail to be highly interesting as well as instructive. I hope he will take the hint.

In the late autumn, the winter and the early spring, easterly winds prevail, and the western suburbs receive the smoke drifts from the east, but, at that period, the wealthy are out of town, indulging in country sports, Parliament is adjourned, while those who cannot afford the country establishment, barricade their front windows and retire to the rear, occupying the dingy chambers overlooking the stable yard of the adjoining mews, and by a strong effort of the imagination dream they are in the midst of a lively landscape. The whims and caprices of fashion are not to be understood by any process of reasoning, any more than we can reconcile with the demands of common sense, the custom that makes the period for social intercourse and friendly association, the time that should be devoted to repose, seeking our couches about the time we ought to rise—

"When night's dark curtain's drawn aside
By morning's rosy fingers."

Another reason for the streets taking naturally an easterly and westerly direction may, I think, be found in the fact that they are by necessity better ventilated; not only does the westerly wind cool and sweeten them with its refreshing breezes, but during the largest portion of the year, the rising and the setting sun illuminates and enlivens them twice every day, while the streets running north and south receive the advantage only once during the twenty-four hours. This is a matter somewhat theoretical, but, I think it is well worthy the consideration and careful investigation of the sanitary student, with the view of ascertaining whether the direction of the streets have any—and if any, what—influence on the general health of the population.

Having thus glanced at the formation of our business streets and thoroughfares leading to districts dedicated to pleasure, we must turn our attention to the examination of the difficulties to be overcome before our main trunks of communication can be considered perfect, or moderately convenient.

How to employ the industrious poor; how to get rid of the criminal population, are, and ever have been, exciting subjects for discussion. Reformatory societies, prison discipline, labour regulating, crime repressing and fraud preventing, schemes, with suggestions numberless, are spoken from the pulpit, thundered from the platform, and echoed by the press, until the very air gets thick with thoughts of something to be done. Physical discomfort and its consequent moral degradations, have attracted the attention of our Shaftesburys, our Lockes, our Rogers, and our Lethebys, and Parliament will, ere long, be forced to devise some true method of removing or abating those discreditable scenes so frequently disclosed. London is now an epitome of the universe, and contains within its borders not only all that is purest, best, most refined and holiest, but also all that is vilest, basest, wickedest and most barbarous. The several districts are divided from each other, and as accurately defined by the habits of the people, as are the several countries of the earth on a map by Wyld or Arrowsmith. Belgravia, Tyburnia, Bethnal, and the recently discovered Rogerian district of Costermongria, are all peopled by tribes as different in their habits and modes of life, as are the Esquimaux and the loungers on a Parisian boulevard. It is no part of my intention to dive into the recesses of these several regions, and bring into light either the gems and jewels of the one, or the loathsome filth and reeking crime of the other; I leave that for abler hands. My work is to endeavour to bring these several portions of the metropolis more closely together, by suggesting certain improvements, which if adopted would render a journey from the west to the east of London, possible in less than half a day.

The difficulties of the north-west passage, the nearest route to India, the mountains of the moon, have all been measured and resolved. How to bring our Australian cousins into closer relationship, standing as we do towards each other, heel to heel with only a globe of earth between, has had due attention from the public and the legislature, but how to bring the several parts of disjointed London into closer contact by increasing the number of its bridges, widening its streets, embanking its river, or extending and rendering continuous a metropolitan belt of railways, has never to this hour, received the steady and determined attention of the authorities. A spasmodic movement is occasionally made, but with little effect. Instead of a new bridge, they construct a crutch to support the broken back of the old one. They commence a street and leave a wilderness; they attempt a sewer and produce a cesspool. We devote thousands to the evangelization of the barbarous South Sea Islanders, and leave our unfortunate brethren in an adjoining street comparatively uncared for, wallowing in hot-beds of crime, suffering, disease and death. The brightest intellects of the country and ablest engineers of the land, are devising means by which all parts of the

civilized globe shall be placed in immediate contact. The harnessed lightning, obedient to our will, is delivering every moment, at every central seat of commerce, the course of Exchange on Paris, or the price of Consols in Capel Court; but how to shorten the overland route from Charing Cross to Whitechapel is left to a few enthusiastic private persons, who are, I fear, looked upon as lunatics, the matter seemingly being abandoned as hopeless, while the evil is increasing day by day.

So thoroughly has the tedious traffic of the streets become ground into the true Londoner's nature, that, to shorten his course from Piccadilly to the Bank, would be to rob him of a vested right or a natural privilege. If a railway train from Aberdeen or the Land's End arrives in London five minutes behind its time, the indignant traveller vents his spleen and writes a letter to the *Times*, but your dog-collar'd occupant of the knife-board of a Clapham omnibus, will stick on London-bridge for half-an-hour with scarcely a murmur.

Such being the result of the existing state of things, I will now direct your attention

- I. To the conditions of our streets, direct and lateral.
- II. To what they have to accommodate.
- III. To how they may be improved.

We must first direct your attention to the communications, east and west, beginning with the river, whose ample width enables it to supply the best possible means of communication between the City and Westminster and their immediate neighbourhoods.

With all its advantages the Thames remains in a state absolutely disgraceful. The boats are the worst that sail on any river where the traffic is abundant. Our half-penny, penny, and even our best boats are a reproach to the metropolis. They are chiefly used by the very lowest, or perhaps I ought to say the poorest or the humblest classes. As there is no respectable approach to any pier on the south side, and very few on the north, the general moving public must avoid the river until the boats are enlarged and the approaches made reputable.

Let any person examine the accommodation, and say whether it is not discreditable. Neither cab nor carriage can approach within two or three hundred yards of the piers, while the proper descents to the river by the noble stairs at London-bridge, are abandoned to other and not very creditable purposes. The pier at Paul's Chain is equally inconvenient; the one at Blackfriars is much better, and almost the only respectable landing along the river. At the Temple, Hungerford, and Westminster, are repeated the objections already named.

Leaving the river for the present, we examine the line of omnibus traffic from Piccadilly to Whitechapel; and here we must observe that the convenience afforded to traffic and facility for continuous progress must be measured, not by the maximum but by the minimum width of the streets. We all know the effect of the endeavour to empty a bottle more quickly by inverting it. A series of gurgling spasmodic efforts to escape ensue while the progress of the liquid is absolutely retarded. So with our streets. Take Temple Bar as an instance. Along the Strand the progress is steady and rapid; there is room for two or three conveyances each way, making five or six altogether. They approach Temple Bar; the two or three vehicles passing eastward are met by two or three going westward. But supposing there are only two proceeding each way, there is only room for one to pass through the Bar in each direction at the same time. The process is like drawing a wire; the two lines of traffic are drawn into one, and the result is, that carriages occupy exactly double the time they ought to do. This is obstruction the first, and the experience of all now present will confirm the fact. At Chancery-lane a stream of traffic from Camden-town to Kennington, by way of Blackfriars, swells the tide, and, meeting with contending currents in Farringdon-street, they chafe, or rather "chaff" each other, and all progress is for a while suspended. Fleet-street is blocked up; by and by that is

cleared, and there is a cheerful trot round St. Paul's. A slight check is felt at the corner next to Cheapside, and a third lock takes place in the Poultry, we pass the shoals of the Mansion House, where the diverging streets are as numerous as the mouths of the Danube, and ultimately we get into the straits of Cornhill, but a fourth lock occurs in the gorge of Leadenhall; we wind through Aldgate, get into Whitechapel, and arrive at Mile-End, a distance of four or five miles in the short space of two hours and a half.

It would be interesting to arrive at the annual amount of the loss sustained by brewers, wharfingers, carriers, and proprietors of public conveyances through stoppages in the streets. An ingenious friend of mine has gone into the calculation, and come to the conclusion that, within the City boundary, what might be done in ten minutes usually occupies fifteen minutes, sacrificing one or two thousand pounds per day, or from £300,000 to £600,000 per annum; but taking the loss at £300 per day, there is a loss of £100,000 annually, an amount almost sufficient to build a bridge once a year.

Omnibuses from Hoxton, Hackney, Shoreditch, Mile-End, Blackwall, Blackwall Railway, and London Bridge Railways, all meet at the Mansion House, and must pass Cheapside in their way westward, whether they go by the Strand, or by Holborn and Oxford-street. New Cannon-street has hitherto done nothing to relieve this traffic, and only the arm of the law and the determination of the magistrate, aided by the police, will secure regulations calculated to benefit every user of public conveyances. West of St. Paul's the narrowness of Ludgate-street and Newgate-street, the latter aggravated by the crowd of butchers' carts, greatly interrupt the course of traffic, but Temple Bar on the one side, and Middle-row on the other, are obstacles which ought to be removed forthwith, as preliminary to still greater improvements.

If the direct communications east and west are in this unsatisfactory state, what can be said when we look at the lines of traffic across the river. The population occupying the area from Blackwall to the Lower-road, Islington, and on a line with Goswell-street, seeking to cross the river, can only do so by London Bridge. So in the South; the entire traffic of the district from Greenwich to Clapham, embracing Peckham, Brixton, Camberwell, and Kennington, must use the same bridge; the consequence is, that the amount of pressure at this point is excessive and unexampled. The traffic of a town is like the drainage of a country, every district supplies its tributary stream, until the accumulated mass rolls on in a mighty tide. Pursuing our course northward, we find that the next bridge having any amount of traffic is Blackfriars. Omnibuses and cabs from Islington meet at the Post-office, pass round St. Paul's or along Newgate-street, twist down the Old Bailey into Ludgate-hill, and turn into Farringdon-street, and so over the bridge to Kennington. The whole district of Pentonville, Camden-town, and Somers-town, with Tottenham-court-road as its western boundary, creep along College-street or Hampstead-road, down Gray's-inn-lane or Holborn, and get into Chancery-lane, where, like other matters in Chancery, they are kept some time. At last they turn into Fleet-street, then proceed to Farringdon-street, and on to Blackfriars. Blackfriars is, and always has been, a bad bridge, and the sooner it is rebuilt the better; its gradients are destructive to horseflesh, being about 4 feet in 100, or 1 in 25, a steepness hardly admissible on an average turnpike-road. The traffic westward seeking to cross the river, generally proceeds by way of Westminster-bridge. Southwark and Waterloo are only used occasionally, for the free British spirit rebels against a toll. The majority of men would rather drive a mile that costs a shilling than pay a halfpenny on compulsion. In practice there are only three bridges across the river open to the public, London, Blackfriars, and Westminster, their aggregate accommodation being less than one-third

of the amount required. Here I may be permitted to quote a passage from a pamphlet of mine on the bridges of London:—

"Let them contrast their bridge accommodation with that of Paris. They would find that over the Seine, in a distance of four miles and a half, there were fourteen bridges, or one in 580 yards. If they added the others leading to the old city, the number would be increased to twenty-seven, all of which were free, while the population was little more than one-third of that of London. If distance should alone determine the number of bridges necessary, and if Paris were to be taken as the standard, instead of six bridges in London, they ought to have forty-two. And what still more aggravated the evil was, that between London and Westminster they had but one free bridge, and that was broken-backed. If they took Lyons, another French city, as an example, they would find that in five miles there were twelve bridges over the Saône; and in three miles and a half they had seven over the Rhône—nineteen altogether. As there the population was only 350,000, or about one-seventh of ours, if population were to be taken as the criterion for the number of bridges required to place London on a level with Lyons in that respect, there ought to be one hundred and thirty-two, instead of seven bridges."

Take one fact as an illustration of the whole matter. A person at the Post-office desiring to reach the Elephant and Castle could, had he the convenience of a high level bridge at St. Paul's, reach his destination sooner than with the present means, he can, on the average of journeys, arrive at the southern side of the river by London or Blackfriars bridges.

We abstain from further details under this head, and proceed to consider the second division of our subject.

What are the streets expected to accommodate? This portion of my address I shall give in a tabular form, so that at a glance, all who take any interest in the question, may possess themselves of facts not to be overlooked, in arriving at a just estimate of the duties to be performed. But I may here condense a few facts, worthy of being permanently fixed in the memory.

The population of London was, in—

1801.....	958,863	1831.....	1,654,994
1811.....	1,138,815	1841.....	1,915,104
1821.....	1,378,947	1851.....	2,362,236
1857, (estimated) 2,625,000.			

Since 1801, or within 57 years, the population of the metropolis has very nearly trebled itself; and, therefore, if the streets then existing were required to be of their then capacity to accommodate the population, it follows that a population of three times the number demands a greatly increased width of thoroughfare.

Although population has increased so much, we find that public conveyances have increased in a greater ratio. The number of hackney-carriages was, in—

1801.....	900	1841.....	2,000
1811.....	1,000	1851.....	2,800
1821.....	1,000	1857.....	4,350
1831.....	1,200		

In the first thirty years of the present century the increase of hackney carriages was only 300, or 100 for each period of ten years, being at the rate of ten hackney carriages in a year, while during the last six years the increase has been 1,550, or over 250 per annum. Since 1801 the increase has been such as to multiply the then number nearly five times.

Before 1828, that most convenient vehicle, the omnibus, was unknown in London, being in that year imported from France by Mr. Shillibeer; yet we now observe in the public prints week by week, that one Company has a revenue of half a million sterling per annum, and the estimated capital invested in such property is nearly £3,000,000, the number of carriages under license being somewhere about 3,000.

Trade and commerce have doubtless extended in a like manner, and the number of waggons, carts, and horses must have increased proportionably. Therefore we believe we are justified in concluding that in 1857 we have ten times the number of vehicles traversing the streets that we had in 1801; and what has been done to widen the streets in proportion to this tremendous increase of traffic? Absolutely nothing!

But, it may be argued, if our population has increased as three to one, and our various conveyances as ten to one, our general metropolitan advantages have increased equal to the demand. In lodging accommodation this is undoubtedly correct, but not in our streets, giving room for arterial traffic. For, although many cabs may never—or only occasionally—enter the crowded parts to which we have been referring, nearly all the omnibuses, and nine-tenths of the carts and waggons, must visit those localities; but, estimating the increase at half what it really is, or five times the number since 1801, we repeat that unless the streets were then absurdly wide, an idea that has never for one instant been entertained, it is manifest that the main streets ought to have been nearly doubled in width.

I append tabular statements of the traffic over London-bridge taken very recently, and also the traffic of several parts of the City, taken under the superintendence of Mr. Haywood, the talented engineer to the Commissioners of Sewers of the City of London. These facts incontestably prove the necessity for street accommodation, and it will be seen that generally the pressure is the greatest where the streets are the narrowest, or where they have not been expanded for 50 years, and cannot be widened without an enormous expenditure.

The only reasonable manner in which the evil can be overcome, and the wants supplied, is to open other currents of traffic wherever they are needed and can be accomplished. This introduces us to the third division of our subject.

How can our thoroughfares be improved? The greatest improvements in modern times were the uniform widening of the streets; the new streets opening with Leicester-square and New Oxford-street at the West-end, and within the City the construction of Moorgate-street and New Cannon-street, and above all the building of London-bridge, with its several neighbouring alterations, not only within the City, but in the borough of Southwark, and the new Victoria-street, leading from Blackfriars-bridge to Clerkenwell.

In addition to the improvement as already described of Middle-row and Temple Bar, in the communications east and west, it is indispensably necessary that something should be done to secure at least three great thoroughfares east and west, so that in the event of repairs being required in either, the other two might be always open; to meet this necessity we have on the north a direct line from Charing Cross to London Bridge, by way of the Strand, Fleet-street, Ludgate Hill, St. Paul's and Cannon-street.

The centre line should be the continuation of Cheap-side, north of Paternoster-row, over Farringdon-street by a viaduct bearing slightly to the south of Lincoln's-inn Fields, and so on to meet the improvements in the west, on a line with Piccadilly.

The northern line should be New Oxford-street, a part of Holborn, diverging at the top of the hill, and by a viaduct crossing Victoria-street to Smithfield, passing in front of St. Bartholomew's Hospital, through Bartholomew's-close, across Aldersgate-street on the level, and so in a line with and into London Wall, joining the pavement for Hoxton traffic, Bishopsgate-street for Hackney or Shoreditch traffic, and proceeding down to the river side by way of Houndsditch, the Minories, and Tower-hill, crossing the river by a steam ferry; all these we show on the map now before you.

On the south side, the New-street resolved upon by the Metropolitan Board of Works, will be of immense

TABLE 1.

MR. HAYWOOD'S STREET TRAFFIC,

SHOWING TOTALS OF EVERY DESCRIPTION OF VEHICLE PASSING PER HOUR AND PER DAY OF TWELVE HOURS, AT CERTAIN POINTS, THROUGH CERTAIN STREETS WITHIN THE CITY OF LONDON.

In 1850.	Situation.		Hours Ending												Total of 12 hours.	Average per hour.
			9	10	11	12	1	2	3	4	5	6	7	8		
			A.M.	A.M.	A.M.	Noon.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.		
8th July	Temple-bar Gate†	4*	311	526	704	757	691	664	791	737	738	671	537	614	7741	645
9th "	Holborn-hill, by St. Andrew's Church	5	327	552	670	698	623	606	535	377	915	445	841	317	6906	575
10th "	Ludgate-hill, by Pilgrim-street	6	361	476	728	636	789	514	628	531	619	584	543	420	6829	569
11th "	Newgate-street, by Old Bailey	7	320	528	628	509	555	537	564	738	572	563	467	394	6375	531
12th "	Aldersgate-street, by Fann-st.	20	168	261	208	196	214	235	194	219	235	233	229	198	2590	215
13th "	Cheapside, by Foster-lane.....	2	473	805	1124	1169	1020	1009	1007	1076	1106	964	808	492	11053	921
15th "	Poultry, by Mansion-house†	3	414	762	1071	1080	1043	941	875	910	956	825	802	595	10274	856
16th "	Finsbury Pavement, by South-place.....	14	262	385	475	387	364	345	293	347	483	475	400	244	4460	371
17th "	Cornhill, by Royal Exchange	10	161	364	479	461	487	441	493	451	468	430	354	327	4916	409
18th "	Threadneedle-street	23	98	145	262	214	211	154	212	195	198	205	148	108	2150	179
19th "	Gracechurch-street, by St. Peter's-alley.....	11	258	322	439	507	392	423	464	516	461	436	338	331	4887	407
20th "	Lombard-st., by Birchin-lane	22	137	117	156	188	169	232	237	304	243	209	130	106	2228	185
22nd "	Bishopsgate-street, by Great St. Helen's.....	12	259	408	509	430	396	238	439	432	541	450	404	345	4842	403
23rd "	London Bridge.....	1	680	1128	1332	1124	1094	1048	1101	1180	1344	1308	962	798	13099	1091
24th "	Bishopsgate-street Without, by City Boundary	15	203	329	447	286	307	342	390	335	430	439	323	279	4110	342
25th "	Aldgate High-street, by City Boundary	13	425	422	417	442	445	379	389	409	405	401	331	289	4754	396
26th "	Leadenhall-street, by East India-house†	8	251	429	595	495	594	563	525	569	466	588	437	418	5930	494
27th "	Eastcheap, by Philpot-lane	16	335	346	398	372	378	343	368	393	398	349	294	128	4102	341
29th "	Tower-street, by Mark-lane.....	19	169	222	262	271	292	324	290	262	282	238	164	114	2890	240
30th "	Lower Thames street, by Botolph-lane.....	24	88	130	175	105	105	108	118	147	168	121	69	46	1380	115
31st "	Blackfriars Bridge.....	9	327	381	515	516	465	336	385	416	570	548	463	337	5262	438
1st Aug.	Upper Thames street, rear of Queen-street	21	140	227	165	223	205	160	164	213	253	312	176	93	2331	194
2nd "	Smithfield-bars.....	18	203	230	202	277	276	255	334	267	328	289	288	159	3108	259
3rd "	Fenchurch-street.....	17	206	262	253	343	293	269	272	327	364	259	249	545	3642	303
			6576	9757	12208	11686	11408	10466	11068	11351	12543	11342	9757	7697	125859	10488

* This column shows at a glance the points where the traffic pressure is greatest, No. 1 referring to the largest traffic, No. 2 to the next in succession; the ascending numbers indicating diminished quantities. It is satisfactory to observe, that where the carriage traffic is largest, the pedestrian traffic is also largest; showing clearly where relief should first be given.

† The following is an account of traffic taken on Monday last, the 27th inst.:—Poultry 11,000, Temple bar 9,000, Leadenhall-street 4,800 vehicles in 12 hours.

convenience, although I think the line chosen by Mr. Pennethorne infinitely preferable.

The cross traffic of the metropolis, that is, the traffic north and south, is nearly as important as that east and west. To relieve London-bridge of much of its heaviest traffic, I suggested to a Committee of the House of Commons some years ago, the propriety of establishing steam ferries at all convenient points on the river below London-bridge, and I rejoice to find that a public company has recently been formed to carry out the project. If fairly tested and proved successful, of which I have no doubt, a new era will have commenced in regard to metropolitan thoroughfares.

Southwark-bridge, though badly-constructed, its gradients being nearly as steep as Holborn-hill, should, nevertheless, be made free of toll, and Queen-street, between Cannon-street and Cheapside, made of a width equal to that between Cannon-street and Thames-street. St. Paul's-bridge, which I had the honour to suggest, would, next to London-bridge, have the largest traffic across the river. Being on the high level, and forming the connecting link, in a straight line, between Middlesex on the one side, and Kent and Surrey on the other, it would not only relieve London-bridge, but take half the traffic that now passes over the old and rickety Blackfriars, which, springing from the low ground, is compelled to have a very injurious gradient. Its immediate demolition and reconstruction are demanded by the exigencies of the public service. As the new bridge would be lower in the heading by four or five feet; the incline would be greatly reduced, and still

TABLE II.			
MR. HAYWOOD'S ACCOUNT OF TRAFFIC ON LONDON BRIDGE.			
22nd Oct., 1856.			
Time of Day.	1 Horse.	2 Horse.	3 Horse or more.
8 to 9 o'clock...	625	191	50
9 " 10 " ...	810	359	61
10 " 11 " ...	1,090	414	70
11 " 12 " ...	1,176	390	59
12 " 1 " ...	1,083	342	40
1 " 2 " ...	1,039	378	38
2 " 3 " ...	888	357	37
3 " 4 " ...	1,027	384	40
4 " 5 " ...	1,064	436	45
5 " 6 " ...	1,048	401	53
6 " 7 " ...	750	403	46
7 " 8 " ...	550	310	38
	11,150	4,265	577
1 Horse	11,150		
2 Horse	4,265		
3 Horse	577		
Total.....	15,992		

more so should the piers be of stone, and the span of iron girders.

Temple-bridge would introduce a most important feature in the re-arrangement. It would open up to the river the whole district of Lincoln's-inn-fields, and the squares north of Holborn in a direct line with the south, and thoroughly ventilate the wretched neighbourhood of Drury-lane.

Waterloo-bridge should be made free of toll, and

TABLE III.
LONDON-BRIDGE TRAFFIC,
February 11, 1857, from 8 a.m. to 8 p.m.

	Foot Passengers.	Saddle Horses and Vehicles.
From Cannon-street to the Bridge...	5,910	2,301
From the Bridge to Cannon-street...	4,980	726
	10,890	3,027
From King William-street to the Bridge	8,430	3,310
From the Bridge to King William- street	6,957	2,564
	15,387	5,874
From the Bridge to Gracechurch- street	4,410	2,990
From Gracechurch-street to the Bridge	8,180	3,750
	12,590	6,740
From the Bridge to East-cheap.....	5,580	1,160
From East-cheap to the Bridge.....	2,250	1,043
	7,830	2,203
From South-Eastern and Brighton Railways to Bridge	6,700	1,158
From the Bridge to South-Eastern and Brighton Railways	8,790	1,273
	15,490	2,431
From Tooley-street to the Bridge...	10,260	1,780
From the Bridge to Tooley-street...	9,925	2,198
	20,185	3,978
From High-street to the Bridge ...	13,640	3,070
From the Bridge to High-street ...	8,170	1,740
	24,810	4,810
North side (London):		
To and from Cannon-street	10,890	3,027
" " King William-street	15,387	5,874
" " Gracechurch-street .	12,590	6,740
" " East-cheap	7,830	2,203
	46,697	17,844
South side (Southwark):		
To and from High-street	21,810	4,810
" " *Tooley-street	20,185	3,978
" " Railways	15,490	2,431
* The remarkable feature in this Table is, that 4-9ths of the car- riage-traffic southward proceeds down Tooley-street, and that is all the heaviest traffic.	57,485	11,219

Hungerford widened and strengthened to bear carriage traffic.

At Westminster, whether we are to have one or two bridges, I may leave to the decision of the active gentleman who presides over the department of works.

However necessary and indispensable the accomplishment of all these suggested improvements may be, all of which are carefully described on the maps before you, they only introduce me to the main object of this paper, which was designed to refer chiefly, if not solely, to the embankments of the River Thames. Having at considerable length gone into the general question of improvements, I feel that I have cleared the way for the careful investigation and discussion of the plans proposed.

You will observe from the plan before you that it combines a promenade, a carriage way, and a railway, and should the Government approve, and the River Commissioners agree to the scheme, the entire work might be executed without costing the metropolis or the country a single farthing. The revenue from the railway, and the frontage obtained from the river, would not only compensate all persons having claims, but pay, it is presumed, a handsome dividend to the projectors. The merit of the scheme, as now laid down, is chiefly due to Mr. Charles Liddell, the eminent civil engineer, to whom I am personally indebted for the beautiful drawings now before us, all executed by Mr. Driver.

You will observe that the embankment commences at Westminster Bridge, and terminates at the proposed St. Paul's Bridge. A railway you will observe starts from the Post-office, being in continuation of the Fleet Valley Railway from King's-cross; it follows the road on the embankment along the river, enters a tunnel at Whitehall, and proceeds westward to Richmond and Brentford, so as to catch the omnibus traffic of those districts which is very large, and would be exceedingly profitable.

The gardens of Whitehall, and the Temple are not only retained, but enlarged, while new gardens are to appear in front of Somerset-house. Every street coming down to the river is improved, and a greater amount of wharf accommodation secured than now exists. As time has failed me in having the whole of this plan completed, I purpose, if acceptable to the council, to return to the subject next session, when the whole scheme will be complete, architectural embellishments introduced, and when it will be divested of the incumbrance of a general idea of metropolitan improvements.

Here, however, I must explain that the railway starting from the Post Office, as already described, has

TABLE IV.
LONDON BRIDGE TRAFFIC.
February 11, 1857, from 8 o'Clock a.m. to 8
o'Clock p.m.

	Foot Passengers.	Saddle Horses and Vehicles.
North-West Corner, Up	15,730	—
North-East Corner, Up	25,750	7,410
South-West Corner, Down	16,060	—
South-East Corner, Down	28,150	7,440
The peculiar feature of this Table is its showing that along the lower or eastern side of the bridge there cross in 12 hours.....	53,900	
While along the upper or western side of the bridge there pass only	31,790	

In comparing all these tables with others taken at earlier dates, it is instructive to observe that the increase of traffic is in perfect harmony with the increase of population.

a branch uniting it with the South Western on the one hand, while on the other it is connected with the South Eastern. Could these junctions be effected, this important and often discussed problem—how can the railways on the North and on the South of London be effectually united?—would be solved, and that in the only way that is feasible, at a moderate expense. Taking advantage of the admirable street suggested by Mr. Pennethorne, Mr. Liddell has conceived the possibility of uniting the South-Western with the Brighton and South-Eastern Railways, in a manner that cannot be surpassed. If, instead of sanctioning all sorts of peddling schemes, the authorities would resolve to grapple boldly with what is pressing and imperative, this entire scheme for Thames Embankment, Railway Junction, and a high level Bridge at St. Paul's, would not only be commenced forthwith, but completed in five years. The drawing now exhibited shows the nature of the construction. On the lowest level, facing the river, are the wharves and other matters connected with trade; on a higher level, but receding considerably, is a promenade for pedestrians; next comes the space over which, on iron columns, the railway is to be laid down; next comes the roadway for carriages, 40 feet wide, and then another footway or promenade in front of the houses that may be erected, the entire width for foot passengers, carriage way, and railway, being 100 feet.

Another line, it will be seen, might run along the side of the New-road, from St. Paul's to the Elephant and Castle, and branching off to the left, give railway convenience to the immense omnibus population of Camberwell, Kennington, Brixton, Clapham and Streatham, uniting with the Crystal Palace Railway to the west end, give facility to many visitors and considerably relieving London-bridge of much of its superabundant omnibus traffic. It will be observed further, that it is proposed to unite the Thames Embankment Railway with the Blackwall Railway, in a manner, I believe, altogether novel, the merit of which belongs entirely to Mr. Liddell.

You will see that the railway passes not only behind the houses facing the suggested new street, but absolutely passes through them; the back part of the first floor being surrendered for railway purposes. It may seem a daring scheme, but I am assured that it is perfectly practicable, and from the plan of construction proposed, it is believed that vibration could barely be detected.

The completion of the Railway and Thames Embankment scheme, would open the whole of the river from the centre of the city to the attractive west, to all who might desire to avail themselves of a rapid and regular mode of conveyance. The piers would be rendered more accessible, and so the boats would be more useful. The promenade and carriage way direct from the Bank to Charing Cross, would relieve the traffic of our present overloaded streets, while the railway would convey from St. Paul's to Westminster in a single hour a larger number of persons than could now be conveyed in twelve hours by all the appliances in general use.

No plan for the embankment of the Thames can be acceptable or will be permitted that does not secure the uniform width of the river, and provide additional convenience to the traffic on its surface. It is due to Mr. Liddell to state that all available means have been employed to accomplish these indispensable ends. The most careful surveys, patient study, and engineering skill have been devoted to the subject, and I acknowledge that although I am not possessed of a very sanguine temperament, I am nevertheless impressed with the belief that the greater portion of these suggestions will hereafter be adopted.

The amount of attention paid to the course and convenience of the London traffic, during the past few years, excites the liveliest expectation that something may be effected without any great delay. So numerous have been the schemes proposed, that one gets bewildered in thinking over them all. A considerable number, with

elaborate plans, are contained in the House of Commons' Report of Evidence on Metropolitan Thoroughfares, presided over by Mr. Jackson.

Mr. Paxton's Crystal boulevard was worthy of a chapter in the "Arabian Nights," and could it be completed, would be the realisation of the most wonderful fairy tale ever promulgated.

Mr. Gisborne, Mr. Page, Mr. Bird, and others, favoured the Committee with initiative suggestions, bearing chiefly on the Thames embankment; but none, in my judgment, met so well the requirements of commerce, or of general traffic, as the plan now before us, which, when matured, and elaborated with the addition of its architectural embellishments, will be worthy of London, and that is commendation enough.

We have also Mr. Rammel's suggestions for the establishment of pillar or columnar railways, to run along our public streets on a line with the kerb-stone, which some have irreverently designated the lan-p-post system. Looking at it very carefully, I fear I must conclude that it would be neither safe nor remunerative.

Mr. Mitchell, of Inverness, the distinguished engineer and superintendent of public roads in the north of Scotland, has employed a portion of his time, when visiting the metropolis, in the hope of giving some hints in furtherance of the design we all desire to see accomplished. His main suggestion is a street and railway from the front of the New Gallery near Kensington, across Hyde Park and Grosvenor-square, Regent-street, parallel with Oxford-street, and Holborn, which it crosses near Middle-row; then past the Sessions House, Clerkenwell, and uniting with the Eastern Counties Railway in Bishopsgate, the whole being nearly in a straight line from point to point.

The objection to this and to other kindred schemes is that they overlook the great pressure in the centre. The thoroughfares at the extremities suffer little if any overcrowding from superabundant traffic. The point demanding immediate attention is the central. The entire system has grown so rapidly that the streets in the City are quite incapable of accommodating the traffic forced into them. No scheme can be of any use that does not relieve the heart of the metropolis from its condition of continuous congestion. From every suburb of the metropolis, every morning, the stream of traffic sets in towards the Bank and the Exchange, and every evening the return current sets out with a force and velocity quite irresistible. Such traffic cannot be diverted, it must be accommodated; and the only rational plan is either to open up two new lines leading to and from the centre, or to widen those already in existence. The latter is next to impossible—the former is practicable and the least expensive.

How the plans suggested are to be carried out necessarily presents some difficulty, whether they must be superintended by divided or by centralized authority; whether by a Metropolitan Board of Works, or a commission, or an irresponsible dictatorship, it is not for me to determine. The annoyance increases day by day, and the difficulty of remedying it increases in a corresponding ratio. It is, therefore, manifest that the present is the likeliest time to insure success. We are to have a Commission specially appointed to the conservation and improvement of the river. We have a Board of Works, whose first duty was to attend to the perfect drainage of the metropolis, and I am of opinion that we should have a street commission, whose entire duty should be to lay down new streets, and make such improvements in the old ones as the necessity of the times demands. To do this efficiently, the Commissioners ought to be independent and free from the influences that frequently beset representative bodies, where, by clamour, isolated neighbourhoods secure the advantages of sums of money that might have been more wisely expended for the general good. Right or wrong, there is always difficulty in changing any system in this country. It is just as difficult to change from wrong to

right as from right to wrong. Our nature is to venture nothing, lest all the good predicted should not be realised, and so with characteristic tenacity we adhere to all manner of absurdities and customs, having no other claim for respect than their considerable antiquity. Our river side frontage is a proof of this undeniable peculiarity. The projecting points and receding gaps irregularly alternating produce in their general aspect such an admirable disregard of either the useful or the picturesque, that I verily believe they exhibit all the defects that existed when London was first founded by our barbaric ancestors, 2,000 years ago.

Whether the plans to which I have now had the honour of directing your attention, or some others infinitely more worthy shall be adopted, I am persuaded that a tide in favour of improvement has now set in, and every contribution, however humble, tends to swell the current which, ere long, will become irresistible.

I only hope that no delay will be permitted to occur, and that most, if not all, of us may live to see the river frontage of London not only worthy of the metropolis, but worthy of the nation of which it forms a part, for it ought, in an architectural sense, to be an example to the world.

The advantage and merit of the entire scheme is, that the whole may be proceeded with simultaneously, or any part may be taken up independently. In my opinion the Thames embankment should be first proceeded with, commencing at Charing Cross. As soon as the works were completed to Blackfriars, the first important station would be established, and Fleet-street and the Strand immediately relieved. The next station would be at Old Fish-street, Cannon-street, near St. Paul's, where the works might terminate; or they might be carried on to Gracechurch-street and the Blackwall Railway, as the authorities deemed advisable.

Before resuming my seat I think it is due to Mr. Liddell as well as to myself, to say, that the plans now before you have been in course of preparation for months, and the paper I have just concluded was in the hands of the printer more than a week ago, that neither the one nor the other have in the slightest degree been modified or influenced by the report on the embankment of the Thames which has recently been published by the Metropolitan Board of Works, a report which seems to me to be exceedingly vague and inconclusive. Perhaps it would be well to give them the advantage of the plans I have now had the pleasure of submitting to this assembly.

DISCUSSION.

The CHAIRMAN said he thought it was rather a lowering reflection that in the boasted civilisation of the 19th century they should now be discussing improvements of a public character which were carried out some 2,000 or 3,000 years ago in ancient cities. The aqueducts and sewers of ancient Rome, built nearly 2,500 years ago, would probably last for centuries to come.

Dr. LETHBY regretted that he should have been called upon to commence the discussion, because his experience in this matter was not derived from the highways of the City, but rather from its bye-ways. He could, nevertheless, add his testimony to that of the author of the paper with regard to the difficulties that existed on the eastern side of the metropolis in communicating with manufactories on the south side of the Thames. Nearly the whole of the sugar refineries were located about the neighbourhood of the Tower, and they had to make considerable journeys, not only in getting rid of the produce of their manufacture, but also in obtaining the raw material. He believed that great sanitary advantages would be derived from the proposed scheme of making a road-way along the banks of the River Thames. They knew from experience that a large portion of the fever of the metropolis was attributable to the banks of the Thames in their present

condition. The miasma produced by the exposure of large surfaces of mud, at periods of the year when decomposition went on most rapidly, particularly during the summer months, infected the atmosphere. From what he had gathered from the plans before them he apprehended that there would be no dry banks of the river at all, but the stream of water would be maintained up to the edge of the road-way, and he thought that would be attended with very considerable advantages. That was one great argument in favour of the proposed plan, even if other points were left out of consideration.

Mr. WARE, as a member of the Metropolitan Board of Works, felt called upon to make one or two remarks in explanation of what had fallen from the author of the paper. That gentleman had chosen to depreciate the line of street in Southwark, selected by the Board of Works, but they had not been favoured with any reasons to show that the Board had come to an erroneous conclusion. A great deal of time and attention were devoted to this subject, and the plan of Mr. Pennethorne had been carefully considered by the Board. The architect of the Board had reported that in a portion of the line of street to which Mr. Bennoch gave the preference, there were great engineering difficulties, some of them almost insuperable. Another reason why the plan of Mr. Pennethorne was not selected was, that it was at too great a distance from London-bridge effectually to relieve the traffic of that great thoroughfare. One important point, however, had been omitted from the paper, viz., a continuation of the line of street from the docks and White-chapel, called Commercial-street, which had its present terminus at the Eastern Counties Railway. It should have been told the meeting that it was under contemplation, both by the government and the Board of Works, to continue the line from the Eastern Counties Railway to join Old-street-road, and he (Mr. Ware) had suggested the throwing down the Charter-house wall, and thus opening out a direct communication from the east to the west. This could be effected at a comparatively small expense. The manufactures of the eastern district were required in the western, and a vast amount of benefit would, by the plan he had mentioned, be conferred upon the labouring classes, in the shape of providing them with good houses to reside in, instead of going through property of a superior description, which would have the effect of driving the present occupiers into the suburbs for residence.

Mr. EDWIN CHADWICK, C.B., said he had his own views with regard to metropolitan and other towns' improvements, but it would be impossible to enter into the consideration of so wide a subject that evening. There was, however, one practical point to which he would allude—the question of expense. It would be in the recollection of the members present that a committee of architects and others was appointed, at the instance of this Society, to examine the system adopted in carrying out public improvements in Paris. It was admitted by the members of that committee that the difficulty which lay at the foundation of town improvements of any kind was the exorbitant claims for compensation; and unless some procedure could be fixed upon to diminish the cost of litigation in such matters, there was very little hope of large and effectual operations in the way of town improvements. He looked upon the plan of Sir Christopher Wren for rebuilding the City after the great fire as a model for those who were building new towns in our colonies. It contained an element which had not been sufficiently attended to, either at home or abroad, viz., the diagonal system of streets, by means of which, a town could be more advantageously extended. He (Mr. Chadwick) had recommended to the College of Engineers, that they should make that plan their study. The loss to the public occasioned by the rejection of Sir Christopher Wren's plans on two lines of streets—one line being from Skinner-street, and the other line from Ludgate-street direct

to the Bank, had been estimated at £100,000 a year, whilst the loss in a sanitary point of view was almost incalculable. The plan laid down by Sir Christopher Wren would have insured not only ventilation but drainage. It was however rejected, not by Government red tape, but by Corporation red tape. It was agreed to by the government of the time; it was approved by the Royal Society, and by all the educated classes of the community, but it was rejected by the Corporation of London, who appeared to be fearful by the spread of the population they might lose some of the subjects within their unfortunate jurisdiction. Had this plan been carried into operation the effect in his (Mr. Chadwick's) opinion, would have been to diminish the mortality of London nearly, if not quite, one third. He was emboldened to make this statement from what he knew to be the fact with regard to the rebuilding of Hamburgh. The effect of the plan adopted there had been to expel disease, and while the rich merchants formerly resorted to the suburbs for residence as most healthy, they now preferred residing in the city. With reference to the more immediate subject of the paper, there was much room for improvement in the gradients of the streets of London and in the mode of paving, and also by the adoption of tramways where practicable. He believed it was possible to save one-half the horse traffic of London, and he saw no difficulty in effecting these improvements except that to which he had alluded, viz., that of obtaining the property at a reasonable rate. They could not have a better plan than was adopted in America. When any great street improvements were carried out there, the owner of the property interfered with, was told, "If you prove that you sustain a loss we will pay you for it, but if we can prove afterwards that you have gained you must pay us." By this means the cost of public improvements had been greatly diminished.

Mr. HAYWOOD (Engineer to the City Commissioners of Sewers) said, if he were asked what improvements were required in London, he should say, everything which had been suggested in Mr. Bannoeh's paper. They wanted the Thames embanked, the present toll bridges thrown open, and a railway across the river, with thorough facilities for communication from the east to the west of the metropolis. Of all things more immediately needed, he thought the opening of the bridges was the most important as a starting point. For his own part he was glad that London-bridge was not 100 feet wide; he thought it was a fundamental error to make bridges of great width; the aim should be to separate the traffic as much as possible, and it was better to have two bridges of 50 feet wide each than one bridge 100 feet wide, as in the latter case, by concentrating the traffic into one route, even under the best regulations that could be adopted, it would at times become impeded. He should say that the best application of the public funds at the present time would be made in opening the toll bridges free to the public; they would then be able to see how the traffic distributed itself, for traffic would not be moved arbitrarily out of its ordinary channel. The next step to be carried out should be the embankment of the Thames. That he was inclined even to think should be commenced at once; it would accomplish the three-fold object of an esplanade for foot passengers, a charming drive, and a line of railway. It would also afford excellent facilities for laying down the intercepting sewer, if ever that should be carried out. Then came the question of a speedy means of communication between the City and the southern parts of the metropolis, which he apprehended could only be accomplished by carrying a railway across the river. It was calculated that in 37 years the population of London had doubled itself, and they might conceive what area would be occupied 37 years hence; and therefore, the sooner they had a railway brought through the heart of the metropolis the better and the cheaper it would be done. Mr. Chad-

wick had hinted at the great practical difficulty in the matter, viz., the funds. He (Mr. Haywood,) estimated that to carry out these improvements, a sum of not less than from £10,000,000 to £12,000,000 would be required. He could not agree with his friend Mr. Bannoeh, that bridges across the Thames could be built for £250,000 each. The great item of expense in these cases was the approaches, where they had to deal with huge claims for compensation, a question which, he had no doubt, had entered into the consideration of the Metropolitan Board in designing the new street for Southwark. He had no doubt the amount that would be claimed by Potts, and Barclay and Perkins, would be nearer half-a-million than any other sum. The improvements in Cannon-street West had been carried out under the most economical plan that could well be adopted. They had pulled down only one side of that street, and thus they had only one set of people to compensate. The ground was sold at an enormous price; the corporation had realised the value of the ground rents, and had applied the proceeds to paying off the debt for making the street; but after realizing every tarring that was available, there still remained £800,000 lying buried in that carriage way at the present moment. After that statement he thought they would readily believe that the amount he had mentioned would be required to carry out the contemplated improvements. It was a difficulty which stopped the Government as well as the Board of Works, and Parliament rarely had the courage to vote £500,000 for public improvements, whereas the maligned Corporation had themselves built King William-street, which, in its way, was a great thing. With regard to the question of money, they went to the Continent and admired the elegant streets of Paris, Munich, and Berlin, and yet they grumbled at the idea of any sacrifice to obtain the same results in their own capital. Already there were loud whisperings in the metropolis at the idea of a sixpenny rate, but five shillings in the pound for the next twenty years would not pay for these improvements. He was not speaking too widely in stating that; and unless the metropolitan public were prepared to come down with something handsome, it was hopeless to think of carrying out these important measures. They must, however, be prepared for such a rate; unless they adopted the means employed in continental countries by establishing an *octroi*. The whole of the improvements in Paris had been mainly accomplished by means of an *octroi* upon various articles of consumption, and he contended that the funds for such purposes ought to fall equitably upon all classes of the community, and this could be effected by means of an *octroi* on some article of general consumption. He felt persuaded that the object they had in view would never be accomplished by means of a rate, but must be effected by means of an *octroi*; and for this purpose he could suggest no article of more general consumption by all classes than coals. The tax upon coals in the City of London built London-bridge, New Oxford-street, Victoria-street, and partly Cannon-street. He considered it an excellent tax. He was decidedly in favour of that tax being continued, and he hoped to see it remain in the hands of the local authorities, rather than that it should be transferred into the hands of the government. Without the slightest difficulty, and without creating the smallest disturbance, the coal tax brought in £250,000 a year, raised by a tax of 1s. 1d. per ton. The poorest members of the community scarcely felt the pressure of such an impost, and yet they paid their quota in proportion to the quantity of coal they burned in a year. If they doubled the present amount, and made it 2s. 2d. per ton, there would be an annual sum of £500,000, which could scarcely be raised from any other source with the like facility.

A vote of thanks was then passed to Mr. Bannoeh

The Secretary announced that on Wednesday

evening next, the 6th of May, the Society's second *Conversazione* would be held; and on Wednesday evening the 13th of May, a paper by Mr. J. B. Smith, M.P., "On the Means of Obtaining Increased Supplies of Cotton," would be read.

Proceedings of Institutions.

EXETER.—A lecture on "Comets and Cometary Astronomy," was given to the members of the Literary Society, at the Royal Subscription Rooms, on Friday, the 3rd of April, by James Jerwood, Esq., M.A., Barrister-at-Law. The lecturer gave the notions of Aristotle, Seneca, Tacitus, Cicero, Pliny, &c., as to the physical constitution of comets, and also adduced the opinions of several modern philosophers on the same point. Sir John Herschel considers them to be masses of vapour, capable of reflecting the solar rays from their internal as well as from their external parts, an inference which he thinks is rendered necessary to account for all the phenomena of comets discovered by the telescope—especially that of small stars having been seen through the largest of them. The lecturer gave many reasons to account for the singular and vague notions of the ancients respecting comets, and also why it is that our knowledge of them is still imperfect. One reason is, that there were no telescopes till the 17th century; comets, therefore, up to that time, must have been examined by the eye without any optical assistance. Another reason is, that they are visible only for a very short time, and frequently, before a comet returns, the astronomer who examined it last had passed away. Comets are usually considered to be constituted of three parts:—1, The nucleus, or densest point. 2, the envelope which surrounds the nucleus. 3, the tail. Each of these parts was explained, and the peculiarities in several comets that have appeared, were illustrated by appropriate diagrams. The lecturer gave a condensed epitome of the various effects which have been ascribed to comets, from the earliest times down to the present age, such as the war between Cæsar and Pompey; earthquakes at Lima; eruptions at Mount Etna; Great Plague in London, &c. These and a great number of other singular effects have been attributed to the influence of comets. The lecturer descanted on the palpable absurdity of these superstitious whimsies. Whiston attributed the Deluge mentioned in the Bible, to the effects of a comet; Buffon imagined that the earth and all the planets had been struck off from the sun by a comet. The lecturer, at some length, showed that these theories are altogether imaginary. Great apprehensions have been entertained that a comet would come in contact with the earth, and cause its destruction. The popular terror occasioned by Laland's Memoir, in 1773, was named as an instance. The requisite conditions which must simultaneously exist before such collision can happen were mentioned; and taking the most favourable case, in 281 millions of chances, there is only one which is favourable to a collision. Encke's comet, by its approaching nearer and nearer in each revolution, is the one most likely to bring about such a catastrophe. Olbers, however, has proved that 219 millions of years must elapse before it can happen. But, besides the great improbability of such a collision—taking the physical constitution of comets into consideration, if it should occur—it is utterly impossible that a mass of vapours, like comets, could, in the smallest degree, affect a dense body like the earth. Writers who appeared determined that comets shall bring about some terrestrial catastrophe, have expressed strong apprehensions that disastrous results will at some time happen from a comet's tail mixing with the earth's atmosphere, and, by introducing deleterious gases, render the air destructive of life, instead of being its sup-

port. The lecturer said that Sir Isaac Newton had calculated that, if all the matter constituting the largest and longest comet's tail that has been observed were to be compressed into the same density with our atmosphere, it would occupy only one cubic inch. A uniform atmosphere is about five miles high; it extends round the earth, which is twenty-four thousand miles in circumference;—if one inch of matter of the same density, however intensely poisonous, be mixed with this mass of atmosphere, the result could only be the merest particle mixed with scores of miles of atmosphere! The lecturer gave an historical sketch of several comets that are noted for the events which attended their apparition—the mode of their discovery, the splendour of their appearance, or the light which they have tended to throw on astronomical science; these comets were illustrated by large diagrams. The mode of determining the identity of a comet was explained, and the peculiarities of cometary astronomy given at some length, and also the reason why it is generally more difficult than planetary astronomy. Arago's interesting proof that comets derive most of their light from the sun was given. The last part of the lecture was a discussion on the celebrated comet called the comet of Charles 5th, which is expected to appear between this and 1860, the apprehension of its effects having excited popular terror. One of the chief objects which the lecturer had in view was to prove the utter groundlessness of the popular panic arising from the imagined effects of comets. The lecturer congratulated his countrymen that no such deplorable panic had exhibited itself in England, and expressed the hope that when the expected comet arrives they would welcome it with the interest which it claims, and regard it as a member of our system, which visited us more than 300 years ago, and that the same period might elapse before its next apparition. The unanimous thanks of the society were given to Mr. Jerwood for his interesting lecture.

MEETINGS FOR THE ENSUING WEEK.

- MON.** Royal Inst., 2. General Monthly Meeting.
London Inst., 7. Mr. T. A. Malone, "On Photography; its present condition and most important applications."
Architects, 8. Anniversary.
Chemical, 8. Dr. Anderson, F.R.S., "On the products of the destructive Distillation of Animal Matter."
Entomological, 8.
- TUES.** Royal Inst., 3. Dr. J. P. Lacaita, LL.D., "On Italian Literature—Petrarca—Boccaccio."
Civil Engineers, 8. Mr. George Rennie, "On the Employment of Rubble, and Béton or Concrete, in Works of Engineering and Architecture."
Linnæan, 8. I. Mr. Bentham, "On two new genera of Brazilian Plants." II. Rev. M. J. Berkeley, "On some new Fungi." III. Dr. Macdonald, "On the principles of Systematic Classification of the warm-blooded Vertebrata."
Pathological, 8.
- WED.** London Inst., 3. Prof. Robert Bentley, "On Systematic Botany, with especial reference to the natural systems of arrangement."
Royal Soc. Lit., 4½.
Society of Arts, 8. *Conversazione*.
Geological, 8. Sir R. I. Murchison, "On the Silurian rocks and fossils of Norway, as described by M. T. Kjerulf, and those of the Baltic provinces of Russia by Prof. Schmidt, compared with their British equivalents."
- THURS.** Royal Inst., 3. Prof. J. Tyndall, "On Sound, and some associated phenomena."
London Inst., 7. Mr. T. W. Burr, "On the History and Instruments of the Royal Observatory at Greenwich; and of other celebrated Observatories and Instruments, and the principal discoveries made by their means."
Antiquaries, 8.
Philological, 8.
Photographic, 8.
Royal, 8½.
- FRI.** Astronomical, 8.
Royal Inst., 8½. Prof. T. Crace Calvert, "On the Laws, Contrast, and Harmony of Colours."
- SAT.** Royal Inst., 3. Prof. E. Frankland, "On the Relations of Chemistry to Graphic and Plastic Art."
Royal Botanic, 3½.
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette April 17th.]

Dated 4th April, 1857.

935. John Bourne, 9, Billiter-street—The generation and application of motive power.
937. Henry Harvey and Robert Smith, 22, Surrey-street, Strand—Improvements in raising sunken ships, other vessels, and all other matters and things, from under to the surface of the water, and to prevent their sinking.
939. Elkan Adler, New York, and Francis Barber Howell, Lebanon, State of Ohio, U.S.—Improvements in machines for cleaning knives and other similar articles.
941. John Austen, 33, Rue des Martyres, Paris—Certain improvements for extracting silk and other textile and vegetable substances from the bark and leaves of every description of mulberry trees.
943. Adolphe Leclercq, Trith St. Leger, near Valenciennes—Certain improvements in sleepers for railways.
945. Richard Birkin, junr., and Thomas Isaac Birkin, Nottingham—Improvements in the manufacture of figured lace.
947. Emile Testein, 22, Plaine St. Pierre, Ghent—A new system for the application of electricity as moving power.
949. William Sumner, Preston—Improvements in machinery or apparatus for preparing, slubbing, and roving fibrous materials.
951. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in preserving food. (A communication.)
953. James Hansor, Barnes, Surrey—Improvements in apparatus for consuming gas.
955. John James Rippon, Oakenshaw Print Works, near Accrington—A new or improved instrument or apparatus for straining or filtering colours.
957. Thomas Melling, Rainhill Iron Works, near Prescott, Lancashire—Improvements in taps or valves, and in apparatus to prevent the overflowing of, and letting off, the water from baths.
959. George Tomlinson Bousfield, Loughborough park, Brixton—Improvements in treating india rubber and gutta percha, in order to render the same impermeable to illuminating and other gases. (A communication.)
961. Samuel Clarke, 55, Albany-street, Regent's-park—Improvements in the manufacture of candles and night lights.
963. Alfred Vincent Newton, 66, Chancery-lane—An improvement in the construction of smoothing irons. (A communication.)
965. Charles Goodyear, Leicester-square—An improved manufacture of waterproof fabric, applicable as a substitute for leather, prunella, embroidered and other ornamental fabrics and stuffs.
967. John Horace Taylor, 24, Alma-street, Hoxton—Improvements in regulating the flow of fluids.

[From Gazette, April 24th, 1857.]

Dated 17th January, 1857.

139. Charles Frederic Vasserot, 45, Essex-street, Strand—An improved paint. (A communication.)
234. Charles Townshend Hook, Snodland, Kent—Improvements in the manufacture of paper. (A communication.)
747. Sir Francis Charles Knowles, Bart., Lovell Hill, Berks—Improvements in the manufacture of cast steel.
790. William Seaton, Chester-place, Regent's park—Improvements in the construction of the permanent way of railways, and in the machinery or apparatus employed therein.
791. William Moxon and John Clayton, Bluepits, Lancaster, and Samuel Fearnley, Halifax—Certain improvements in looms for weaving, which said improvements are particularly applicable to looms for weaving carpets and other looped or piled fabrics.
792. Thomas Lawrence, Salford—Certain improvements in steam engines.
794. Henry Lafone, Liverpool—Improvements in tanning.
796. Samuel Hemming, Bow, Middlesex—A new or improved material for roofing or other building purposes.
798. Gustav Julius Gunther, John-street—Improvements in preparing blocks and stones for building purposes.
800. Matthew Augustus Crooker, New York—Improvements in paddle wheels.
802. Robert Mushet, Coleford, Gloucester—Improvements in the manufacture of cast steel.
806. Edmund Hyde, Kingston-upon-Thames—Improvements in the manufacture of fabrics from products of the husks of cocoa nuts.

Dated 23rd March, 1857.

808. Louis A. Normandy, jun., 67, Judd-street—An improved process for manufacturing iron. (A communication.)
810. Thomas Nuttall, Farnworth, near Manchester—An improvement or improvements in machinery for preparing cotton, flax, or other fibrous materials.
812. Ellis Rowland, Manchester—Certain improvements in steam engines.
814. John Smith, 4, Albion-square, South side, Dalston—An improvement in applying steam or other aeriform fluids expansively in engines.

816. Jean Joseph Baranowski, Paris—An improved method of, and apparatus for, signalling upon railways.

818. Marius Chastagnon, 45, Essex-street, Strand—Improvements in tuyers for blast furnaces.

Dated 24th March, 1857.

820. James Tangye and Joseph Tangye, Birmingham—A new or improved lifting jack.
822. Thomas Young Hall, Newcastle-upon-Tyne—Improvements in steam gauges and water indicators.
824. Samuel Fox, Deepcar, Sheffield—Improvements in hardening and tempering steel wire, and in straightening wire.
826. Charles François Leopold Oudry, 4, South-street, Finsbury—Improvements in the preservation of articles of cast, wrought, rolled and forged iron, zinc, and other metals or alloys of metals against oxidation from humidity and other destructive effects of air and water.
828. Thomas Lawes, 77, Chancery-lane—A machine or apparatus to be used in cleansing, purifying, and drying animal and vegetable substances.
832. Pearson Hill, Hampstead—Improvements in machinery for stamping, marking, or printing and arranging papers, letters, and other articles.
834. Reuben Sims, Bedford, near Leigh, Lancashire—Improvements in machinery or apparatus for cutting hay, straw, and other similar substances.
836. John Henderson, Lasswade, Midlothian—Improvements in the manufacture or production of plain and figured fabrics.
838. Robert Cassels, Glasgow, and Thomas Moreton, Mothewell—Improvements in the manufacture of iron.
840. Simon Martin Allaire, Paris—Improvements in manufacturing hats, caps, and bonnets.

Dated 25th March, 1857.

842. John Radcliffe, James Fearnough, and Joseph Mather, Lancashire—Certain improvements in index machines, applicable to looms for weaving.
844. Charles Henry Baker, 7, Angel-court—Railway passengers signal alarm.
846. George White, 5, Laurence Pountney-lane, Cannon-street—Improvements in glass-furnaces. (A communication.)
848. Jean Jacques Constant Benoist, 42, Rue Jerusalem, Brussels—A new method of applying marks on paper for postal purposes.
850. Josiah Latimer Clark, 35, Adelaide-road, Haverstock-hill—Improvements in lighting coal mines.

INVENTION WITH COMPLETE SPECIFICATION FILED.

1108. Charles Barlow, 89, Chancery-lane—A mechanical apparatus for regenerating the impulsive force of any motive power. (A communication.)—20th April, 1857.

WEEKLY LIST OF PATENTS SEALED.

April 24th.	April 28th.
2503. Howard Ashton Holden.	2531. Samuel Russell.
2511. George Henry Bachhoffner.	2538. Louis Adolphe Faure.
2513. Henry Forfar Osman.	2540. Thomas John.
2529. William Armand Gilbee.	2547. John Thomas Way.
2543. William Kopke.	2550. William May.
2599. William Clissold.	2557. John Lawson.
2641. Andrew Barlow.	2562. Henry Hutton.
2642. François Jules Manceaux and Eugene Napoleon Vieillard.	2564. Joseph Browne.
2668. Richard Archibald Broome.	2568. John Parbery.
2677. Samuel Newington.	2572. Josiah Stone.
2706. John Billing.	2515. James Webster.
2723. Richard Butterworth.	2681. The Hon. William Erskine Cochrane.
2740. Louis Adolphe de Milly.	2683. Joseph Hacking.
2793. Henry Bougleaux.	2687. Richard Emery.
2942. Frederick Wm. Anderton and Joseph Deanland.	2691. John Sutherland.
50. Henry Bougleaux.	2705. George Davies.
88. John Chanter and John Wakefield.	2717. Esteves Blanchon.
133. Thomas Jackson Milnes Townsend.	2721. Samuel Cunliffe Lister.
237. John Dangerfield.	2746. James Montgomery Gilbert
370. Leon Talabot.	2753. Louis Dartois.
388. Thomas Fielding Johnson and John Williams	2767. Thomas Roberts, John Dale, and John Daniell Pritchard.
425. Frederic Henry Sykes	2805. Alfred Vincent Newton.
451. William Edward Wiley.	2817. Auguste Cellier.
468. Robert Barlow Cooley.	2829. John Brown.
470. John Naylor	2935. Michael Burke.
	3021. Robert Gibson.
	99. Arnold Goodwin.
	279. Isaac Holden.
	281. Isaac Holden.
	319. James Hamshcer.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

April 20th.	April 22nd.
938. James Coombe	941. Jonathan Davidson.
964. John Evans.	April 23rd.
1032. Charles Benjamin Normand	939. William Edward Newton.
1226. Moses Poole.	1056. Josiah Fenton and James Mackay.
April 21st.	April 24th.
927. Thomas Freeman Finch	955. John Henry Johnson.